IN THE SPECIFICATION:

Please replace paragraph **[0011]** with the following amended paragraph:

[0011] - - Moreover, in current fuel cell designs, the fuel flows by and diffuses into the anode but not ~~though~~ through it. Consequently, inert compounds can build up in the pores and physically block the fuel from reaching the catalyst, hence further limiting efficiency. - -

Please replace paragraph **[0078]** with the following amended paragraph:

[0078] - - In embodiments and methods disclosed herein, fluid flows are established that can include a combination of fuel, electrolyte, and/or water. In addition, the primary use of liquid phases facilitates the incorporation of any suitable functional additives such as surfactants, detergents, solvents, preservatives, buffers, and the like. For instance, solvents and/or detergents can be added to assist in cleaning the electrodes of poisons or toxins and microclimate concentration gradients. Additives can assist in dissolving compounds that could otherwise precipitate out and cause a cake or other obstruction that physically clogs the electrodes. Additives can break up the surface tension of product water globules to reduce efficiency-sapping microclimate concentration gradients. In conventional direct methanol cells, which do not employ a flow-through design and cleaning additives, concentration gradients limit designers to larger, more wasteful platinum particles. Additives can also function to oxygenate the electrolyte to further enhance cleaning. ~~Additive~~ Additives appropriate for such functions are readily available and known to persons skilled in the art. - -

Please replace paragraph **[0090]** with the following amended paragraph:

[0090] - - Figure 2H illustrates an embodiment in which a porous substrate 180 includes walls 182 that are hollow and thus have interiors 184 distinct from voids 186. In some embodiments, a thin film 188 is disposed not only on the surfaces of walls 182 facing voids 186 but also on inner surfaces of walls 182 facing interiors 184. Pores 190 provide communication between interiors 184 of walls 182 and voids_186, which may enable catalytic and/or ionic activity within interiors 184 of walls 182. - -

Please replace paragraph **[0102]** with the following amended paragraph:

[0102] - - Balance-of-plant apparatus 404 includes means for recirculating fluid back to fuel cell 402, supplying or replenishing fuel, and maintaining fuel concentration to the supply side of anode 412. One or more fuel-processing or separating chambers 440 are provided separately from fuel cell 402. Fuel-processing chamber 440 includes a semipermeable membrane 442 that selectively impedes water while allowing fuel and electrolyte to pass, producing a relatively fuel-rich fluid on the downstream side of this membrane 442. Membrane 442 is just obstructive enough to prevent the fuel-rich fluid from mixing back into the fluid on the upstream side of membrane 442. The fuel-rich fluid enters a conduit and/or manifold 444 at an exit port 446 of fuel-processing chamber 440 and is routed to inlet 430 of anode-side chamber 422. In addition, a fuel supply source 450 is provided with an injector 452 or other discharge means communicating with conduit 444 to supply fresh fuel to fuel cell 402. As indicated by the arrows, post-anode, relatively fuel-depleted fluid collected in fluid collection chamber or manifold 426 enters a conduit and/or manifold 462 and is routed to an inlet port 464 of fuel-processing chamber 440 to membrane 442. As previously noted, membrane 442 separates fuel from the fluid on the

upstream side of membrane 442 such that the fuel becomes concentrated on the opposing downstream side. The resulting, even further fuel-depleted, water-rich fluid on the upstream side of membrane 442 is ideal for cathode function, and is recycled back to fuel cell 402 by flowing through an exit port 466 of fuel-processing chamber 440, through a conduit or manifold 468, and to inlet ~~416~~ 428 of cathode-side chamber 424. Cathode 414 uses the water to make hydroxyls for the electrolyte. Hydrostatic pressure and other pressure differentials in fuel cell system 400 can be sufficient to maintain relatively continuous flows of fluid through fuel cell system 400. A pump (not shown), however, can be positioned at an appropriate location within fuel cell system 400 if needed or desired. It can be seen in this embodiment that the cathode 414 does not encounter much fuel, and thus the well-known, undesired fuel crossover effect is minimized. In addition, the net fluid flow is in the direction of the hydroxyl diffusion (generally, cathode 414 to anode 412), which increases mass transport. - -

Please replace paragraph **[0110]** with the following amended paragraph:

[0110] - - Figure 14 illustrates a fuel cell system 700 according to another embodiment. A pump 702 circulates both air and the fuel/electrolyte/water fluid combination. Air is flowed through a chamber or manifold portion 704 to another chamber or manifold portion 706, from which the air is flowed through the intra-cathode space of a fuel stack assembly 710. The air then flows over the semipermeable membrane of a water/pressure/thermal management system 720 (see Figures 11A – 11C and related description). The fluid combination is routed to a pre-cathode assembly 732 via a conduit 734, and is mixed with fresh fuel in a fuel mixing chamber 736. Pre-cathode assembly 732 serves as an additional [[an]] cathode, and represents another technique for balancing the differential kinetics between the anode and cathode material in a fuel

cell. A fuel supply source 738 such as a tank and injector 740 are used to introduce the fresh fuel into fuel mixing chamber 736. The resulting fuel-rich fluid then flows through a fluid input manifold 742 and into the intra-anode space of fuel cell stack assembly 710 and into the anode material. Fuel-depleted fluid is collected in a fluid output manifold 744 and routed to water/pressure/thermal management system 720 via a conduit 746. - -

Please replace paragraph **[0124]** with the following amended paragraph:

[0124] - - The embodiments and methods disclosed herein can include means for refreshing the electrolyte. In conventional alkaline fuel cells, the electrolyte slowly reacts with product and ambient CO_2 to form an inert product. The most common example of this reaction is:

$$\cancel{KOH + CO_2 \rightarrow K_2CO_3 + H_20 + heat}\ \underline{KOH + CO_2 \rightarrow K_2CO_3 + H_2O + heat}$$ - -

Please replace paragraph **[0132]** with the following amended paragraph:

[0132] - - An example of one implementation of a refresh cycle is illustrated in the simplified schematic view of Figure 15. A fuel cell 800 comprises a plurality of electrodes E arranged as anodes and cathodes according to any suitable arrangement. A microprocessor μP or any other suitable electrical controller, as well as associated circuitry, is placed in electrical communication with each electrode E. During normal operation of fuel cell 800, electrodes E generate a current that is routed to an appropriate load L in the ordinary manner of fuel cells. During operation, microprocessor μP can be programmed to switch one or more electrodes E to initiate a refresh cycle, during which time the associated circuitry, which can include a DC voltage source and/or an AC voltage (which may be a waveform generator with adjustable frequency and amplitude), applies electrical energy to the one or more electrodes for the purpose of refreshing a selected

electrode E. After the time period for refreshing has elapsed, microprocessor µP can switch the electrode or electrodes E involved in the refresh cycle back to the normal mode of operation and switch another electrode or set of electrodes E to operate the refresh cycle. In this manner, at any given instant of time during operation of fuel cell 800, a desired number of electrodes E are always operating normally to produce the required amount of electricity, while at least one other electrode E is being refreshed by electrical means. Microprocessor µP can be placed in ~~communicating~~ communication with the load side of the electrode arrangement in order to cut off or disconnect a selected one or more electrodes E from load L for a set period of time. In this manner, current collected by an electrode E can be prevented from flowing to load L, whereby charge builds up in the electrode E. Allowing the build-up of charge, even without applying electrical energy to the electrode E, can be sufficient to effect the refresh cycle. The building up of electrical charge within the structure of electrode E can cause poisonous/contaminant components to separate from the catalytic material and be washed away by the fluid flowing through electrode E. The build-up of electrical charge can also cause bubbles to form on the catalyst, physically separating the poisonous/contaminant components from the catalytic material, and can promote the formation of oxygen and hydrogen components that act as cleaning agents. - -